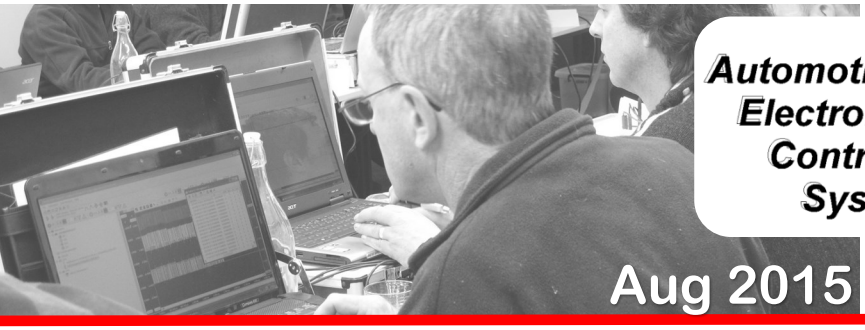

Automotive Electronic Control Systems

AECS
Training, Equipment and Data for Automotive Diagnostic Specialists

Aug 2015 Technical Newsletter

AECS - Knowledgeable, Reliable, Passionate and Quality.

This article is a true description of an AECS technical help desk problem and how it was solved.

Vehicle

2010 Mercedes Sprinter 2.2ltr twin turbo Common rail Diesel.

Problem presented to the Helpdesk

The vehicle came in with a power steering fluid leak and it had the glow light in the dashboard staying on unusually long.

We rebuilt the power steering pump and now it winds over, fires up briefly and dies again. It sounds just like it is running out of fuel every time!

The van was running beautifully before we removed the pump.

We scanned for fault codes and all we get in the engine management system is “2134-004 Glow plug cylinder 2 open circuit”.

We checked everything we possibly could have disturbed, while removing/refitting the pump, and cannot find anything.

In the close proximity of the pump is the throttle body, the intake air-pressure sensor, the crankshaft sensor, fuel hoses from the filter to the high-pressure common rail pump and its return hoses. None of these looked damaged or disturbed. This van truly leaves us out in the cold! This should have been an easy and profitable job; it has turned into a nightmare!

Can you please help?

Measure

In cases like this, us at the help desk, always start by demanding a scope recording of an injector versus the rail pressure sensor. However, this shop did not own a scope.

Therefore, as an exception we tried to get the most out of his Launch scan tool by looking at live data and fault codes.

Live data (Picture 1) showed with 'key on engine off' that the rail pressure was 11 Bar, which is perfect as the in-tank lift pump delivers a pressure of 10 Bar, which it will push through the high pressure pump's check valve into the common rail.

Data Stream Login

SPRINTER V20.40 > Data Stream

Name	Value	Unit
Rail pressure	11.11	bar

Picture 1: Launch live data
Key on engine off

This gave us confidence in the rail pressure sensor. While winding over, and while firing up, the pressure increased to +/-350 Bar, which is also perfectly normal.

The pressure control in this CP3 system is via a quantity control valve (SCV) which is metering Diesel entering the high-pressure pump, AND with a pressure control valve (PDV). Both valves showed as being actuated with a variable duty cycle during winding over, firing up and when the engine stalled.

Yet by looking in detail the suction control valve's duty cycle (Picture 2) dropped just before (or after…) the engine had died, very hard to tell the exact sequence of events on a scan tool.

Data Stream Login

SPRINTER V20.40 > Data Stream

Name	Value	Unit
Fuel temperature	5.60	degree C
Pedal value sensor Sensor 1	0	%
Pedal value sensor Sensor 2	0	%
Pressure control valve	18.75	%
Quantity control valve	25.88	%
Rail pressure	263.84	bar

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New Sessi... Graph Record Print Help

Picture 2: Launch live data screen shot when engine fired up

Was the engine management shutting the engine down?

The doubt was not helping. We could not say for sure if the ECU stopped the engine by altering the duty cycle of the SCV, or if the change of duty cycle was the result of the engine dying.

Let us first go all out to fix the only fault code "2134-004 Glow plug cylinder 2 open circuit".

In our minds as a long shot, we could see it as a possibility that the ECU was keeping track of the amount of starts with a crook glow system. Poor glow creates high quantities of soot, which can block the DPF

(Diesel particulate filter). The ECU could perhaps be stopping the engine from firing up to prevent the filter from blocking up…Without a fault code, and without being able to see such a counter on the scanner? Nah.

Yet still fix the glow fault first, on Mercedes we have experienced funny issues before because of ignoring warning signs, like coolant level light on, with perfect coolant level and perfect working level sensor and no fault codes. Only to find on one model that the fuse to the coolant fan has popped, and on another model that the refrigerant in the AC system had leaked out (pressure 0 Bar).

Glow plugs or glow controller?

The technician measured the resistance of the glow plugs and found one glow plug had 0.5 Ohm, while the others had 0.9 Ohm in cold state. A set of 4 new plugs was ordered and fitted. This had no effect *and* the fault code was still there.

Nice! That make us feel confident!

The code indicated (Picture 3) that the fault was actually present, so it should be easy to find…

Each glow plug has its own individual high current wire from the glow controller. We measured the current to each plug and found that there was no current to glow plug 2, even though the plug measured fine and the high current glow plug cable showed no signs of damage.

We started to suspect the glow controller.

Diagnostic Trouble Code Logi

R V20.40 > Diagnostic Trouble Code

DTC	Description	State
2134-004	R9/2 (Cylinder 2 glow plug) - Open circuit	Current and stored

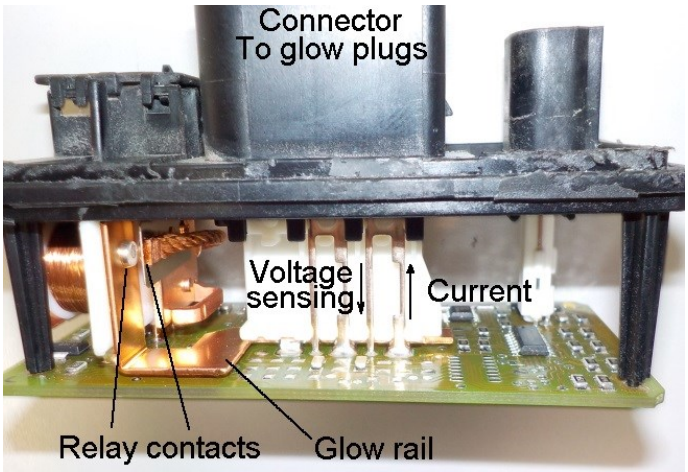
Picture 3:

Open up

After opening up the glow controller (Picture 4), we discovered that even though each plug has its own cable, that all glow plugs get their current through one set of relay contacts.

From the relay contacts, the current splits into four strands. Each strand has 2 tabs, one that carries the current from the relay to the glow cable, and one that connects the processor in the glow controller to the glow cable to measure the voltage.

We found that on the strand of cylinder two that the current track had burned away.



Did you know……?

AECS believes training is an important key to the success of your workshop along with high quality equipment. AECS has introduced training credits. Earn $50* credit for every $1000 spent to go towards your next training. Putting more value back into your business.

*Terms & conditions apply

The Staff at ***AECS*** have a huge amount of knowledge and practical know how....We understand the products we sell, we can help you get the most out of what you buy from us. ***Take for example***

Peter *BE(Hons)*

His technical background along with Automotive R&D experience has enabled him to create and deliver, with pride, the ***CANBus diagnostics seminar,*** *besides other* ***AECS*** *courses.*

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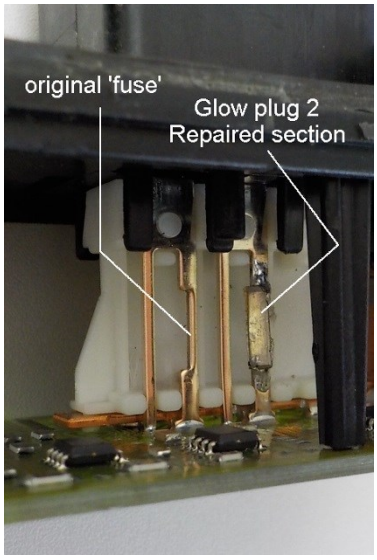
To prove if this was our issue we soldered a tab across the gap. I admit it was not a very nice repair but for now, it did the trick. (picture 5)

We reset the fault code and started the engine…

Still NO GO! Yet the fault codes stayed away now.



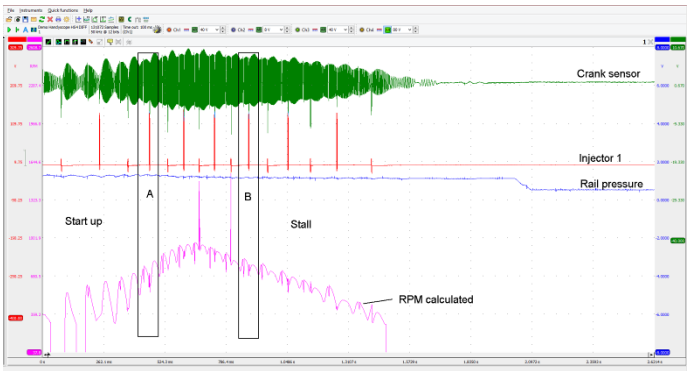
Picture 5:

Blocked DPF?

It could well be possible that the filter was blocked solid stopping the engine from getting rid of its exhaust gas, however to block a filter just with 20 or so start-ups did not sound logical but just in case we asked the technician to disconnect the DPF and try starting again. No difference, the engine fired up and died, just that same.

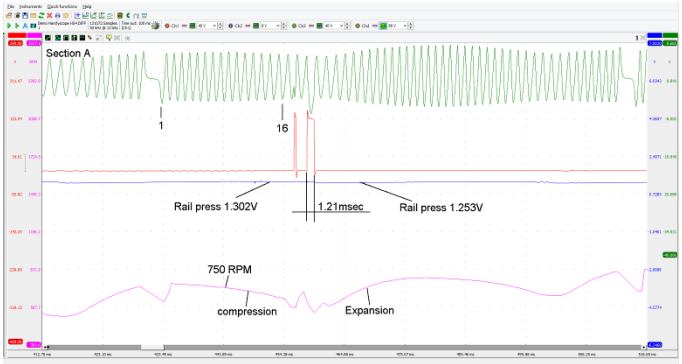
Measure

It is now time to start clean, from the beginning and measure. The vehicle went to a workshop, which has AECS tech support and one of our scopes.
Start with injection vs rail pressure as we said right from the beginning. Since this workshop owns a 4-channel ATS scope, the diagnostician also decided to record the crank sensor signal. (Picture 6)



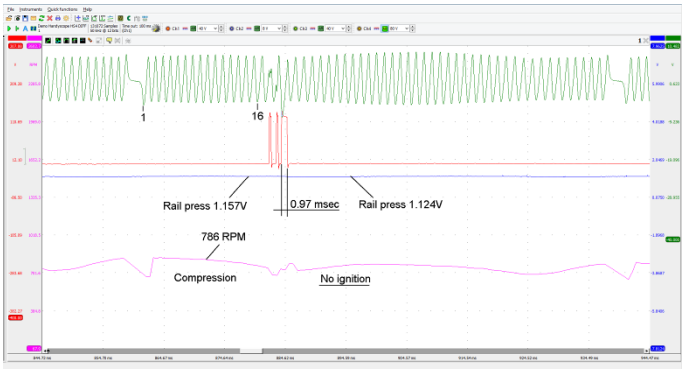
Picture 6: ATS 5004d scope recording crank, injector 1 and rail pressure when the engine fires up and dies

The clue is in the detail, as always, I do not believe that anyone from a distance can say what has gone wrong here. So zoom in on area A (Picture 7)where the engine is gaining speed, and area B where the engine is on its way down to stall. The revs in these areas are about even so the conditions should be about even. If the ECU turned the engine off, we should see a big difference in injection or rail pressure between area A and B .



Picture 7: Zoomed in on recording, area A at approx. 750 RPM (increasing).

In the area A, you can see the rail pressure drop when injection takes place (fuel exits the rail), also take note of the injection timing in relation to the crankshaft sensor. In the calculated RPM pattern, you can see the RPM reducing because of compression and sharply increasing after injection.



Picture 8: Zoomed in on recording, area B at approx. 786 RPM (decreasing).

It is visible that the rail pressure is still present (Picture 8) and also that the rail pressure drops after injection, indicating that the injector is pumping fuel even though the engine is on its way down to stall!
The injection timing is virtually the same as in A, even though there are now 2 pilot injection pulses.
This is significant, we have actual injection yet the engine dies! In the RPM line, you can see that there is virtually no RPM increase after injection.

So we have fuel, a healthy engine, yet no combustion, even though the injection timing is perfect….

Air
That can only mean that there is no air coming into this twin turbo engine.

What could have gone wrong during the power steering pump replacement…..?

To remove power steering pump the air filter box has to be removed. This is done by disconnecting the filter housing from the intake tube to the primary turbo. I would put a rag over that tube as soon as the filter housing is removed to stop dirt coming in. In my mind, things perhaps gone wrong there.

Rag

I suggested to the diagnostician that the technician perhaps must have forgotten to cover the tube and that somehow something got into the tube blocking the airflow.

A quick inspection of the tube showed two rags sucked hard up against the primary turbo blocking off all air flow!! The technician did use a rag to cover the tube after all…..

Try that; find a rag with the scope!

The rag was removed, the turbo inspected for damage, after which the engine started and ran normally again.

Conclusion

Needless to say that the technician, who lost his rags, received 'some' comments.

A man made problem like this can cause some serious head aches, as you can clearly miss the obvious. However, in this case, going back to basics and starting at the beginning with top quality equipment did the trick.

We are a New Zealand owned company working hard for customers who purchase quality equipment from us.

Consider this; our prices are reasonable, our quality is good. Why would you buy from for example some large multinational company who are trying to copy our equipment range and try to sell it for more? Is it just because they have sales people traveling around? Is it just because they have stores in every city? To me do the costs of sales people or having stores, add no value to any of the equipment, yet obviously you need to pay for it.

The team at AECS, are only a call or a mouse click away, we keep it simple. Try us!

AECS spends a great deal of time and funds in upskilling ourselves (all our technical support engineers). Yet this case was a new one for us.

Can you see how important it is to have someone to turn to when you hit that brick wall? I can only kindly ask; please consider ***AECS*** for your equipment and training, support a NZ owned company that supports you!

For ***AECS*** Ltd
Herbert Leijen
(trainer/research)
06 8749 077

"Did You Know....?"

Parallel import awareness.

Buyer beware!!

Make sure you check for full functionality of the scan tool before you buy it.

AECS supplied professional range fully optioned Launch Pro series tool	Parallel imported tool, limits what you can do.

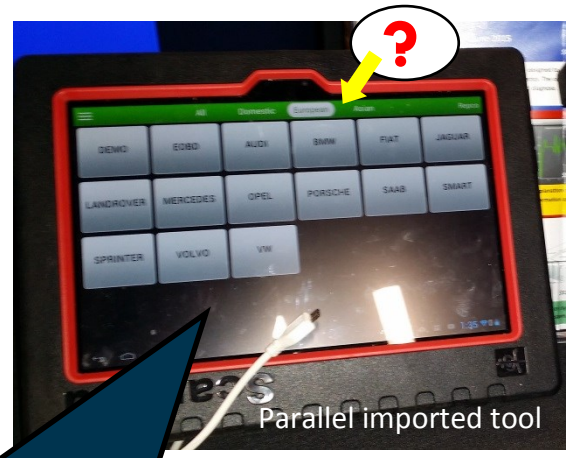
For Example: Asian Brands

Compare

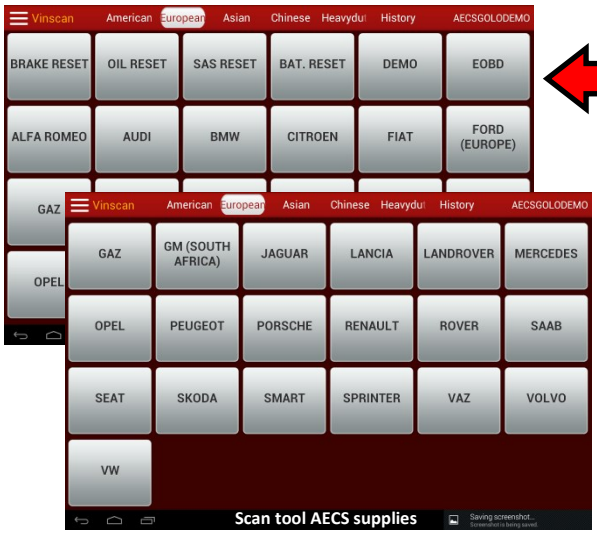
For Example: Chinese Brands

AECS Professional Launch scan tools have Great wall, Chery, Foton, Mahindra,

Compare



For Example: European Brands



Compare

Please note: AECS does not provide any technical (or warranty) assistance on these similar priced 'look a like' tools which were designed for the USA market.

*"Some 'clever' sales people will tell you that they are identical to the professional series Launch tools AECS supplies to the NZ automotive industry. They are not. Some cases the sales people will state that we at AECS back those tools up. **We won't**."*

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2. Most of our customers find the AECS tech support access direct from the Pro series scan tools an absolute 'sweet' addition!
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